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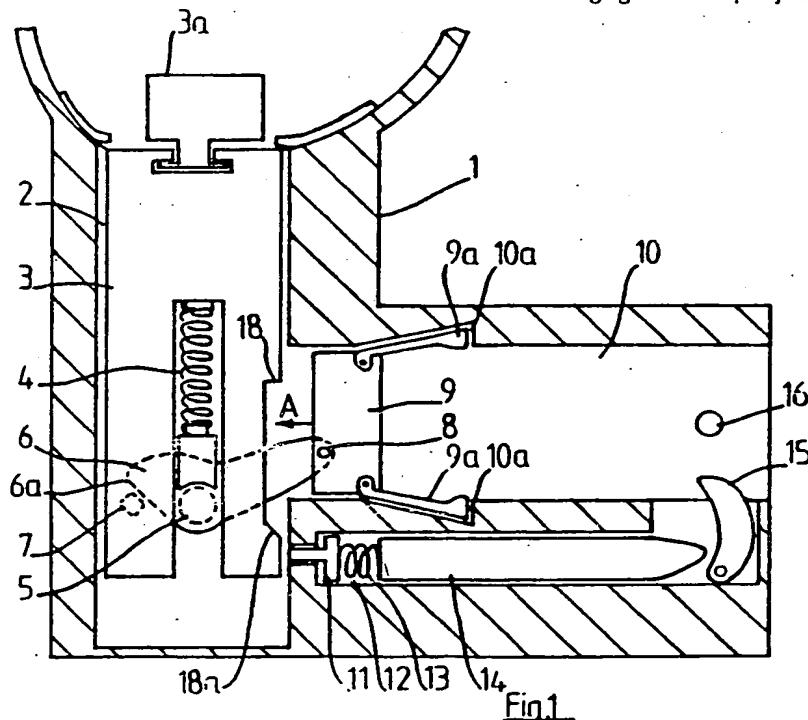
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## (54) Locking device

(57) A locking device (e.g. for use as a vehicle steering lock) has a locking bolt 3 operable by a plastic card encoded key inserted into chamber 10. A latch (not shown) is provided to retain the locking bolt in a locked position (shown) until a sensor 16 reads and verifies information stored on the encoded key as the key is inserted. A solenoid then disengages the catch to allow the key to operate the locking bolt by pushing a member 9 which causes a cam 6 to rotate on axis 5 and engage a bolt projection 7.



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The drawing(s) originally filed was/were informal and the print here reproduced is taken from a later filed formal copy.

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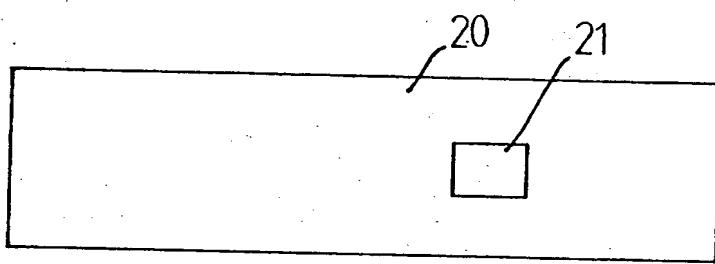
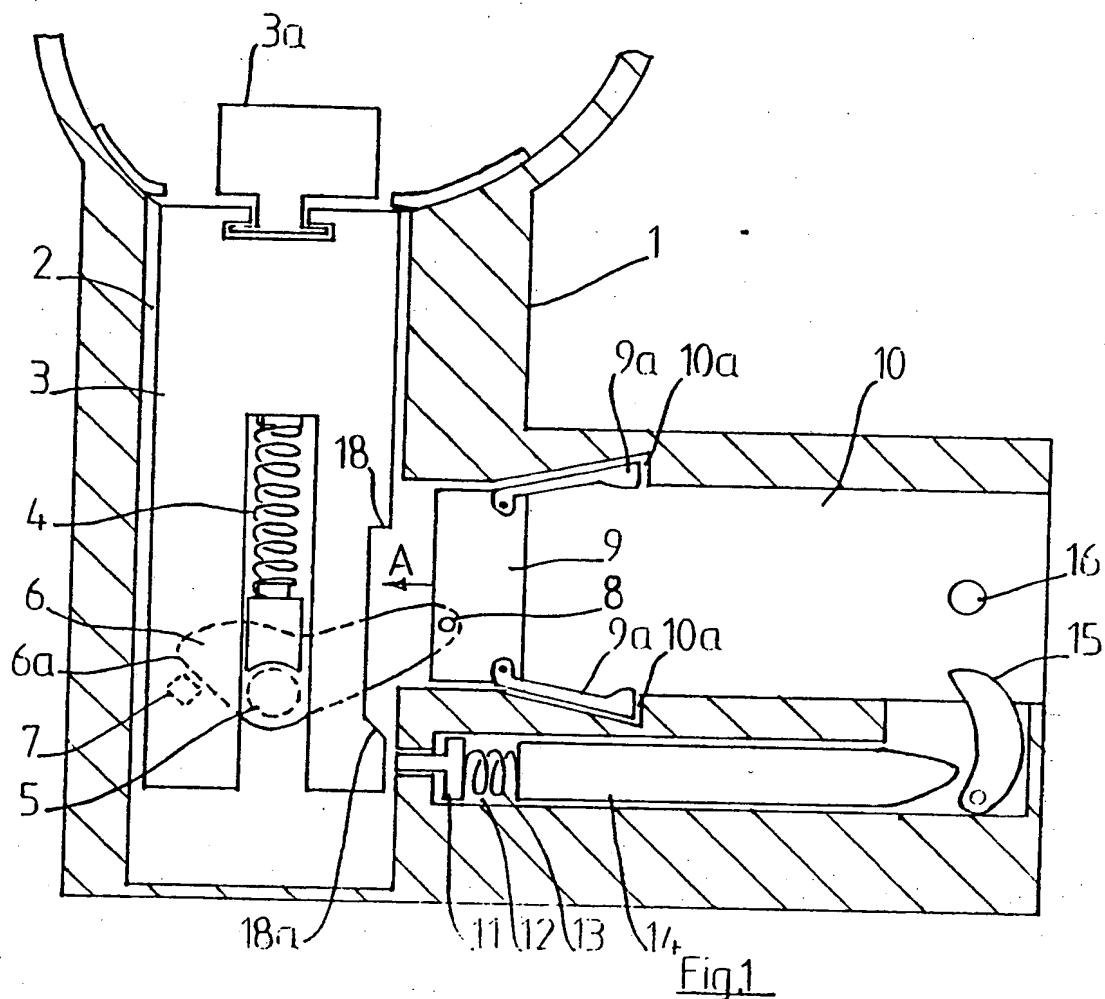


Fig.4

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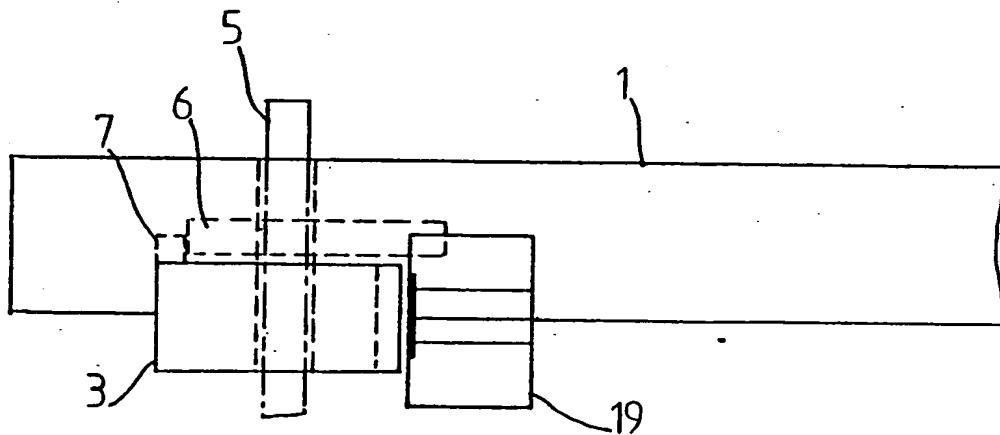


Fig.2

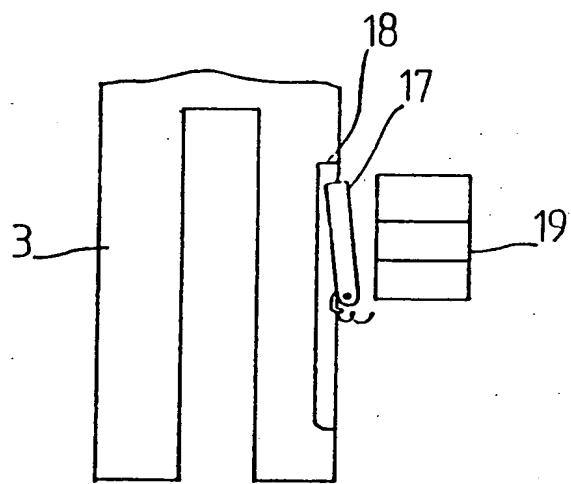


Fig.3

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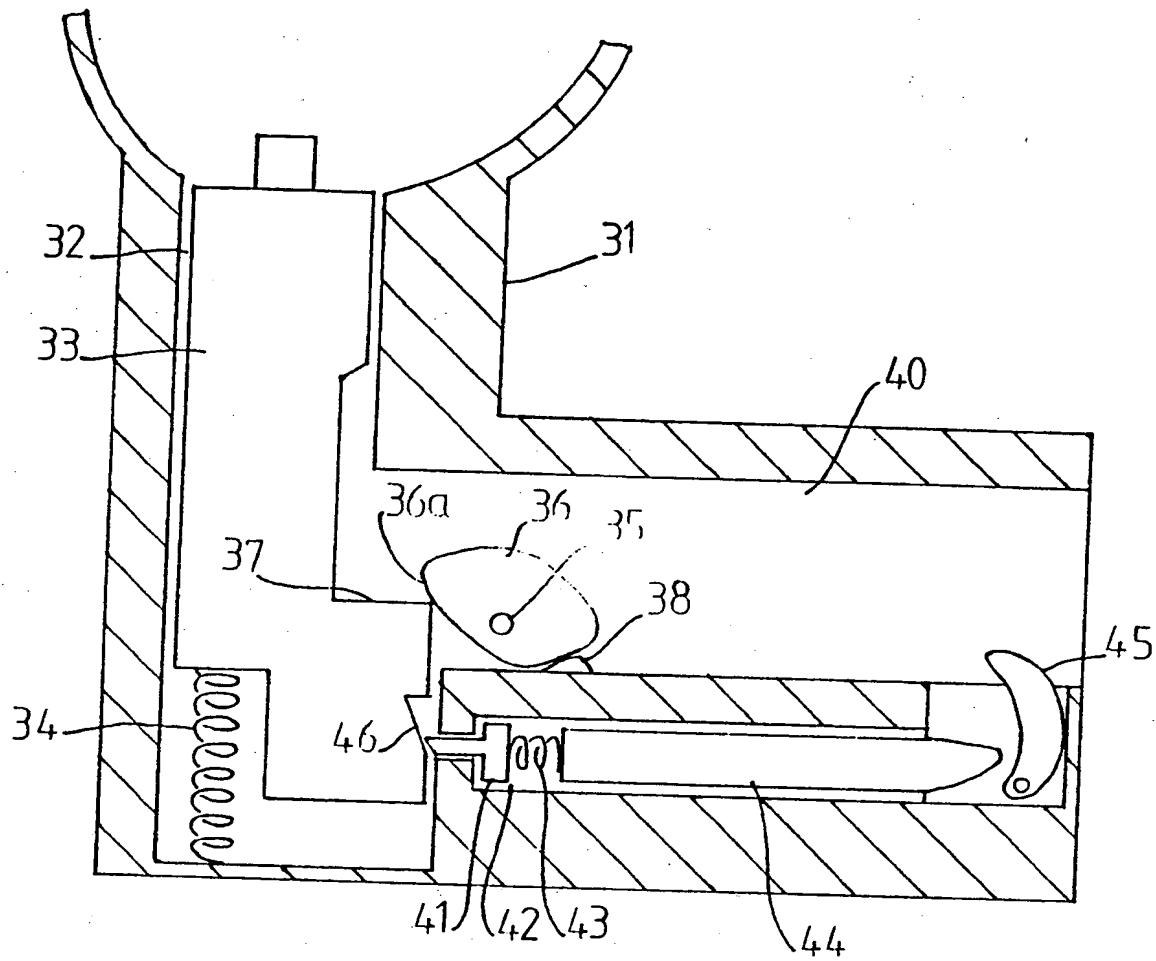


Fig.5

## SPECIFICATION

### Locking device

5 This invention relates to a locking device for use as a steering lock for vehicles.

Steering locks are an important feature on vehicles and various different types of steering locks have been previously proposed. Proposals have been made of steering lock mechanisms in which, for increased security, the lock mechanism is operated by an electronically coded plastics key card.

While such an electronically operated lock increases security compared to conventional mechanical key operated locks there are difficulties in ensuring that such locks conform to safety regulations which determine that steering locks cannot engage when a vehicle is in motion.

According to the present invention there is provided a locking device comprising a locking bolt movable between a first, locked position and a second unlocked position, key means operable so as to move the locking bolt between its locked and unlocked positions, wherein a catch is provided which in a first position engages the locking bolt to retain the locking bolt in the locked position, sensor means being provided to read information stored on the key means and to operate the catch such that the catch moves to a second position in which the catch is disengaged from the locking bolt so that the key means may be operated to move the locking bolt.

Preferably, the catch is solenoid operated.

Preferably also, the key means is slidable in the locking mechanism to operate a cam member which engages the locking bolt to move it from its locked to its unlocked position.

Preferably also, the locking bolt is resiliently biased towards its locked position so that it returns to its locked position on removal of the key means from the lock mechanism.

Preferably also, retaining means are provided to retain the locking bolt in its unlocked position once the locking bolt has been moved to the unlocked position while the key means is engaged in the locking device.

Preferably also, the key means is a plastics material key card.

Preferably also, the key means has an electrically encoded area for storing information to be read by the sensor means.

Preferably also, retaining members are provided which are biased towards the key means on engagement of the key means in the locking device so as to retain the key means in the locking device.

Preferably also, the locking bolt is a steering lock for a vehicle.

Preferably also, the cam member is mounted on a shaft which rotates with the cam member to operate the ignition switch of a vehicle.

Embodiments of the present invention will now be described, by way of example, with reference to the accompanying drawings, in which:

70 Fig. 1 is a sectional side view of a locking device in accordance with the present invention;

Fig. 2 is a plan view of part of the locking device of Fig. 1;

75 Fig. 3 is a side view of part of the locking device of Fig. 1;

Fig. 4 is a side view of a key card for the locking device of Fig. 1; and

Fig. 5 is a sectional side view of a second embodiment of a locking device.

Referring to Figs. 1 to 4 of the drawings, a locking device comprises a casing 1, having a chamber 2 in which a locking bolt assembly 3 is slidably mounted. The locking bolt assembly

85 3 is resiliently biased towards a locking position, as illustrated in Fig. 1, by a spring 4 which engages a pivot shaft 5 in the casing 1.

A cam member 6 is mounted on the shaft 5. A projection 7 on the bolt assembly 3 is en-

90 gaged in use by a bearing surface 6a on the cam 6. A projection 8 on the cam 6 is slide-  
able in a groove in an intermediate member 9 which is slidably mounted in a key chamber 10 in the casing 1. A pair of retaining mem-

95 bers 9a are pivotally mounted on the interme-  
diate member 9 and engage cut-outs 10a in the casing 1 adjacent the chamber 10.

A locking member 11 is slidably mounted in a guideway 12 in the casing 1 and is biased

100 towards the chamber 2 by a coil spring 13 and a thrust member 14 which is acted on by a cam 15 pivotally mounted in the guideway 13 and which extends into the chamber 10 in the casing 1.

105 A sensor 16 is mounted in the casing 1 at the side of the chamber 10.

A catch member 17 is pivotally mounted in the casing 1 and in use engages a cut-out 18 in the bolt assembly 3, as illustrated in Fig. 3.

110 A solenoid 19 is provided to operate the catch member 17.

A plastics material key card 20 is provided for the locking device. The key card 20 has an electrically encoded area 21.

115 In use, the locking device is used as a steering lock for a motor vehicle with a pro-  
jection 3a on the bolt assembly 3 engaging the steering column of the vehicle.

To disengage the steering lock the key card

120 20 is inserted into the key chamber 10 so that it engages the intermediate member 9.

The sensor 16 reads the encoded area 21 on the key 20 and, if the code is correct, causes the solenoid 18 to operate to disengage the

125 catch member 1 from the cut-out in the bolt assembly 3.

The key card 20 is now moved along the key chamber 10 to cause the intermediate member 9 to move in the direction of arrow

130 A. The projection 8 on the cam 6 moves

along the groove in the intermediate member 9 causing the cam 6 and pivot shaft 5 to rotate in the casing 1.

The bearing surface 6a on the cam 6 engages the projection 7 on the bolt assembly 3 causing the bolt assembly 3 to move along the chamber 2 against the spring 4 to disengage the projection 3a from the steering column.

10 The pivot shaft 5 may be connected externally of the casing 1 to the vehicle ignition switch so that further movement of the key card 20 causes the pivot shaft 5 to operate the ignition switch of the vehicle and, if desired, the vehicle starter.

The presence of the key card 20 in the key chamber 10 causes the cam 15 to pivot against the thrust member 14 to tension the coiled spring 13 against the locking member 11.

20 When the bolt assembly 3 has moved to its unlocked position the locking member 11 extends into the chamber 2 to engage the cut-out 18 of the bolt assembly 3.

The key card 20 is retained in the key chamber 10 by the retaining members 9a being biased towards the key card 20 by their movement along the cut-outs 10a in the key chamber 10.

When the locking device is to be locked the key card 20 is removed. The locking member 11 engages a lower edge 18a of the cut-out 18 on the bolt assembly 3 and prevents it from moving to its locked position until the key card 20 has cleared the cam 15 allowing it to pivot away from the thrust member 14 so as to remove the tension in the coiled spring 13 which bears against the locking member 11.

The tension in the spring 4 is now sufficient to overcome the reduced tension in the locking member 11 and the bolt assembly thus moves back to its locked position.

If a key card 20 having an incorrect coding 21 is inserted in the locking device then the solenoid 19 will not operate, the catch member 17 will remain engaged and the bolt assembly 3 will not unlock.

Similarly, if a tool other than a key card is used the solenoid 18 will again not operate and the bolt assembly 3 will not unlock.

Referring now to Fig. 5 of the drawings, a second embodiment of a locking device is shown. The lock mechanism comprises a casing 31 having a chamber 32 in which a locking bolt assembly 33 is slidably mounted.

The locking bolt assembly 33 is resiliently biased towards a locking position by a spring 34. A cam member 36 is mounted on a shaft 35 in a key chamber 40 in the casing 31. A step 37 on the bolt assembly 33 is engaged in use by a bearing surface 36a on the cam 36. A projection 38 in the key chamber 40 limits the rotation of the cam member 36.

A locking member 41 is slidably mounted in a guideway 42 in the casing 31 and is biased

towards the chamber 32 by a coiled spring 43 and a thrust member 44 which is acted on by a cam 45 pivotally mounted in the guideway 43 and which extends into the chamber 40 in the casing 31.

A plastics material key card, similar to that shown in Fig. 4, is provided for the locking device.

In use, the locking device is used as a steering lock for a motor vehicle with a projection 33a on the bolt assembly 33 engaging the steering column of the vehicle.

To disengage the steering lock the key card is inserted into the key chamber 40 so that it engages the cam 36.

The key card is now moved along the key chamber 40 to cause the cam 36 to rotate in the casing 31.

The bearing surface 36a on the cam 36 engages the step 37 on the bolt assembly 33 causing the bolt assembly 33 to move along the chamber 32 against the spring 34 to disengage the projection 33a from the steering column.

90 The presence of the key card in the key chamber 40 causes the cam 45 to pivot against the thrust member 44 to tension the coiled spring 43 against the locking member 41.

When the bolt assembly 33 has moved to its unlocked position the locking member 41 extends into the chamber 32 to engage a cut-out 46 on the bolt assembly 33.

When the locking device is to be locked the key card is removed. The locking member 41 engages the cut-out 46 on the bolt assembly 33 and prevents it from moving to its locked position until the key card has cleared the cam 45 allowing it to pivot away from the thrust member 44 so as to remove the tension in the coiled spring 43 which bears against the locking member 41.

The tension in the spring 34 is now sufficient to overcome the reduced tension in the locking member 41 and the bolt assembly 33 thus moves back to its locked position.

The key card may be electrically encoded and the lock mechanism provided with appropriate sensors which on detecting the correct key encoding operate the vehicle ignition circuits.

Similar types of locking devices may be used for applications other than vehicle steering locks.

Modifications and improvements may be incorporated without departing from the scope of the invention.

#### CLAIMS

1. A locking device comprising a locking bolt movable between a first, locked position and a second unlocked position, key means operable so as to move the locking bolt between its locked and unlocked positions, wherein a catch is provided which in a first position engages the locking bolt to retain the

locking bolt in the locked position, sensor means being provided to read information stored on the key means and to operate the

5 catch such that the catch moves to a second position in which the catch is disengaged from the locking bolt so that the key means may be operated to move the locking bolt.

2. A locking device as claimed in Claim 1,

10 wherein the catch is solenoid operated.

3. A locking device as claimed in either Claim 1 or 2, wherein the key means is slideable in the locking mechanism to operate a cam member which engages the locking bolt

15 to move it from the locked to the unlocked position.

4. A locking device as claimed in any one of the preceding Claims, wherein the locking bolt is resiliently biased towards the locked

20 position.

5. A locking device as claimed in any one of the preceding Claims, wherein retaining means are provided to retain the locking bolt in the unlocked position once the locking bolt

25 has been moved to the unlocked position while the key means is engaged in the locking device.

6. A locking device as claimed in any one of the preceding Claims, wherein the key

30 means is a plastics material key card.

7. A locking device as claimed in any one of the preceding Claims, wherein the key means has an electrically encoded area for storing information to be read by the sensor

35 means.

8. A locking device as claimed in any one of the preceding Claims, wherein retaining members are provided which are biased towards the key means on engagement of the

40 key means in the locking device so as to retain the key means in the locking device.

9. A locking device as claimed in any one of the preceding Claims, wherein the locking bolt is a steering lock for a vehicle.

45 10. A locking device as claimed in any one of Claims 3 to 9, wherein the cam member is mounted on a shaft which rotates with the cam member to operate the ignition switch of a vehicle.

50 11. A locking device substantially as hereinbefore described with reference to Figs. 1 to 4 or Fig. 5 of the accompanying drawings.

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